

# Service Manual

## **CIRCUIT DESCRIPTIONS REPAIR & ADJUSTMENTS**



**ORDER NO.  
ARP-820-0**

### **FM/AM DIGITAL SYNTHESIZER TUNER**

**TX-960(BK) KU**  
**TX-960L(BK) HE, HB**  
**TX-960L HE, HB**

MODELS TX-960, TX-960(BK), TX-960L AND TX-960L(BK) COME IN FIVE VERSIONS DISTINGUISHED AS, FOLLOWS:

Type	Applicable model				Power requirement	Destination
	TX-960 (BK)	TX-960	TX-960L (BK)	TX-960L		
KU	○	—	—	—	AC 120V only	U.S.A
KC	○	—	—	—	AC 120V only	Canada
HE	—	—	○	○	AC 220V, 240V (Switchable) *	European continent
HB	—	—	○	○	AC 220V, 240V (Switchable) *	United Kingdom
NEZ	○	○	—	—	AC 220V only	West Germany

\* Change the primary wiring of the power transformer.

- This service manual is applicable to the TX-960(BK)/KU, TX-960L/HE, HB and TX-960L(BK)/HE, HB.
- As to the HE and HB, please refer to pages 27-36.
- As to the NEZ and KC types, please refer to the additional service manual (ARP-821)
- TX-960(BK) (TX-960L(BK)) is the same as the TX-960 (TX-960L) except for the exterior design (color).
- The AM tuner of the TX-960L (TX-960L(BK)) is a two wave-band tuner with MW (medium wave) and LW (long wave), but the TX-960 (TX-960(BK)) is MW only.
- TX-960(BK) is black version of TX-960 and TX-960L(BK) is black version of TX-960L, too.
- Ce manuel d'instruction se réfère au mode de réglage, en français.
- Este manual de servicio trata del método ajuste escrito en español.

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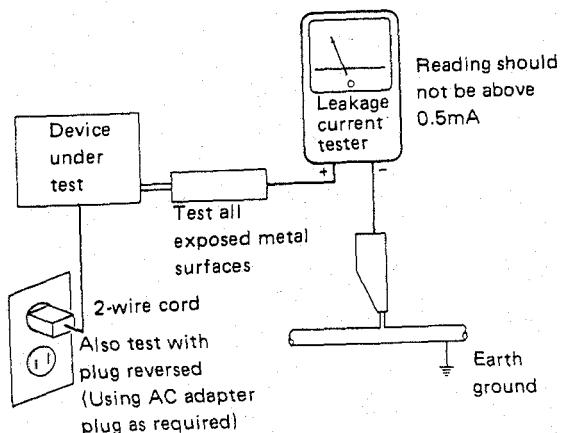
# 1. SAFETY INFORMATION

## 1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technical.

### LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.



AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

## 2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a 1 on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which does not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

## 2. SPECIFICATIONS

### Model TX-960L

#### FM Tuner Section

Frequency range	87.5 MHz to 108 MHz
Usable Sensitivity	11.2 dBf, IHF (1 $\mu$ V/75 $\Omega$ )
Sensitivity (DIN)	Mono; 0.9 $\mu$ V/75 $\Omega$ Stereo; 31.5 $\mu$ V/75 $\Omega$
Signal-to-Noise Ratio	Mono; 77 dB (at 85 dBf) Stereo; 73 dB (at 85 dBf)
Signal-to-Noise Ratio (DIN)	Mono; 66 dB Stereo; 60 dB
Distortion	Stereo; 0.4% (1 kHz)
Alternate Channel Selectivity	67 dB (400 kHz)
Stereo Separation	40 dB (1 kHz)
Frequency Response	30 Hz to 15 kHz $\pm$ 1.0 dB
Antenna Input	300 $\Omega$ balanced 75 $\Omega$ unbalanced

#### MW Tuner Section

Frequency range	531 kHz to 1,602 kHz
Sensitivity (IHF, Loop antenna)	300 $\mu$ V/m
Signal-to-Noise Ratio	50 dB
Antenna	Loop Antenna

#### LW Tuner Section

Frequency range	153 kHz to 281 kHz
Antenna	Loop Antenna

#### Audio Section

Output Level	
FM (100% MOD)	650 mV
MW/LW (30% MOD)	150 mV

#### Miscellaneous

Power Requirements	
HE model	a.c. 220 Volts $\sim$ , 50/60 Hz
HB model	a.c. 240 Volts $\sim$ , 50/60 Hz
Power Consumption	10 W
Dimensions	420(W) x 60(H) x 215(D) mm
Weight (without package)	2.3 kg (5 lb 2 oz)

#### Furnished Parts

FM T-type Antenna	1
AM Loop Antenna	1
Connection Cord with Pin Plugs	1
Operating Instructions	1

#### NOTE:

*Specifications and design subject to possible modification without notice due to improvements.*

### Model TX-960

#### FM Tuner Section

Frequency range	87.5 MHz to 108 MHz
Usable Sensitivity	11.2 dBf, IHF (1 $\mu$ V/75 $\Omega$ )
Signal-to-Noise Ratio	Mono; 77 dB (at 85 dBf) Stereo; 73 dB (at 85 dBf)
Distortion	Stereo; 0.4% (1 kHz)
Alternate Channel Selectivity	67 dB (400 kHz)
Stereo Separation	40 dB (1 kHz)
Frequency Response	30 Hz to 15 kHz $\pm$ 1.0 dB
Antenna Input	300 $\Omega$ balanced 75 $\Omega$ unbalanced

#### AM Tuner Section

Frequency range	530 kHz to 1,600 kHz
Sensitivity (IHF, Loop antenna)	300 $\mu$ V/m
Signal-to-Noise Ratio	50 dB
Antenna	Loop Antenna

#### Audio Section

Output Level	
FM (100% MOD)	650 mV
AM (30% MOD)	150 mV

#### Miscellaneous

Power Requirements	
KU and KC models	AC 120 Volts, 60 Hz
Power Consumption	10 W
Dimensions	420(W) x 60(H) x 215(D) mm 16-9/16(W) x 2-3/8(H) x 8-1/2(D) in
Weight (without package)	2.3 kg (5 lb 2 oz)

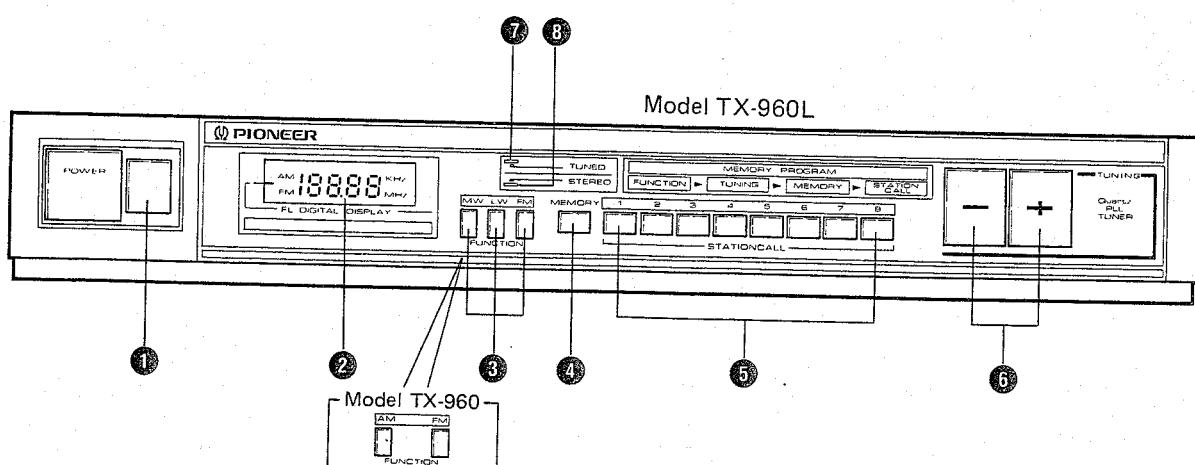
#### Furnished Parts

FM T-type Antenna	1
AM Loop Antenna	1
Connection Cord with Pin Plugs	1
Operating Instructions	1

#### NOTE:

*Specifications and design subject to possible modification without notice due to improvements.*

### 3. FRONT PANEL FACILITIES



#### ① POWER switch

When this switch is set to the on position, power is supplied to the tuner's main circuits. The unit's POWER switch is geared to selecting the transformer's secondary and so even at the standby position, the unit's circuitry will work as long as the power cord is connected to a power outlet. Disconnect the power cord from the power outlet when you do not plan to use the unit for a long period of time.

#### ② FREQUENCY display

This shows the frequency of the station currently being received in digital form. The FM band is indicated by MHz, and the AM band by kHz.

#### ③ FUNCTION switches

These are used to select either the FM, MW, LW broadcasting bands.

FM: Push to receive FM band broadcasts.

MW: Push to receive MW band broadcasts.

LW: Push to receive LW band broadcasts.

Only AM/FM switching is available for the TX-960 model.

#### ④ MEMORY switch

Press to program stations. The memory circuit will operate for about 10 seconds after the switch is pressed, allowing stations to be programmed in the STATION CALL switches during this period. About 10 seconds after the MEMORY switch is pressed, the memory circuit ceases operating, and no stations can be programmed. In this case, press the MEMORY switch again.

#### ⑤ STATION CALL switch

These are used to preset and recall broadcasting stations.

#### ⑥ TUNING switch

These are used to locate the station. Push either of these two switches: the left switch “-” to go to a lower, and the right switch “+” to go to a higher frequency.

#### ⑦ TUNED indicator

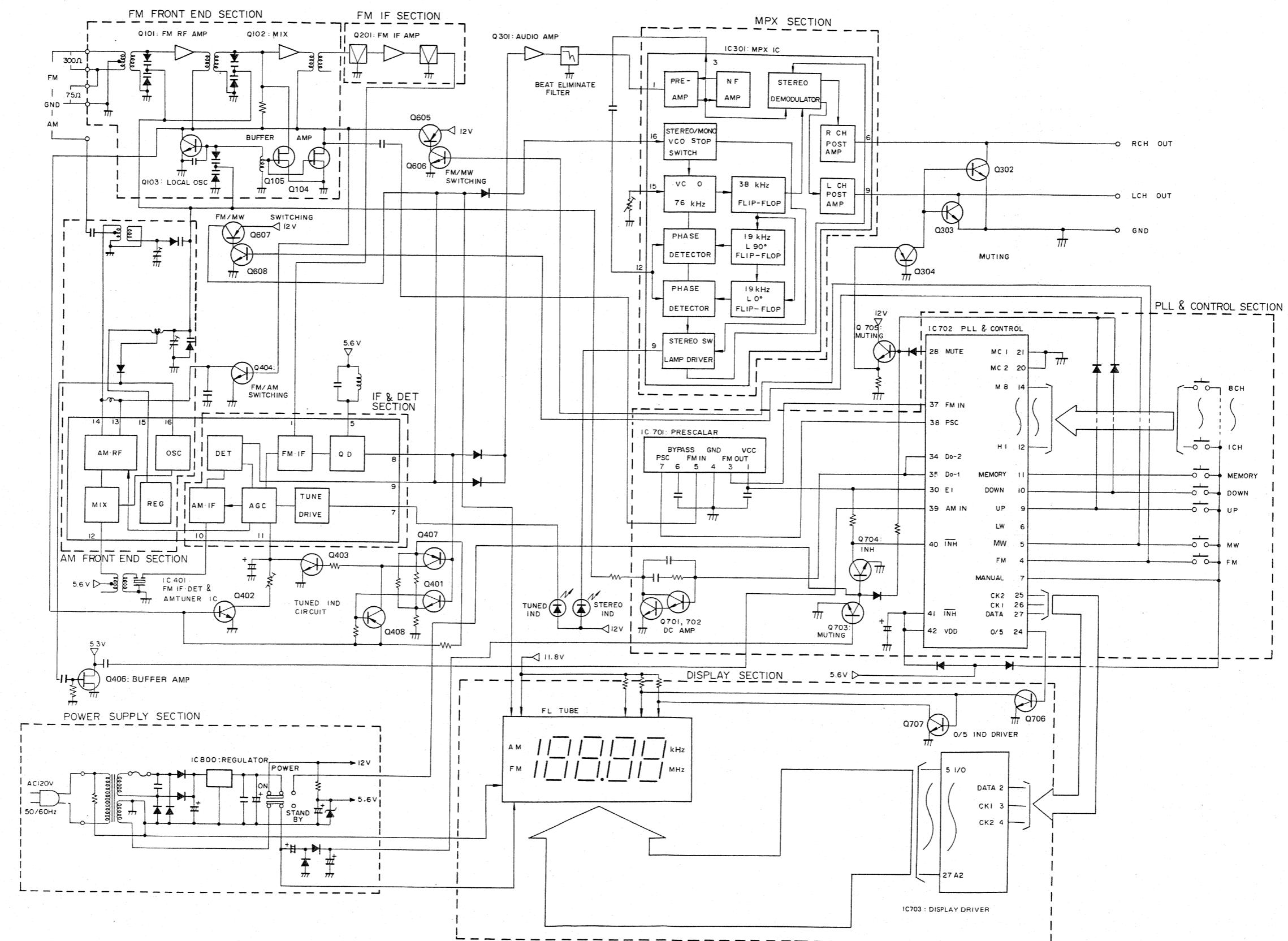
This lights up to indicate when finest tuning of a station has been achieved.

#### ⑧ FM STEREO indicator

This lights when a stereo program has been picked up.

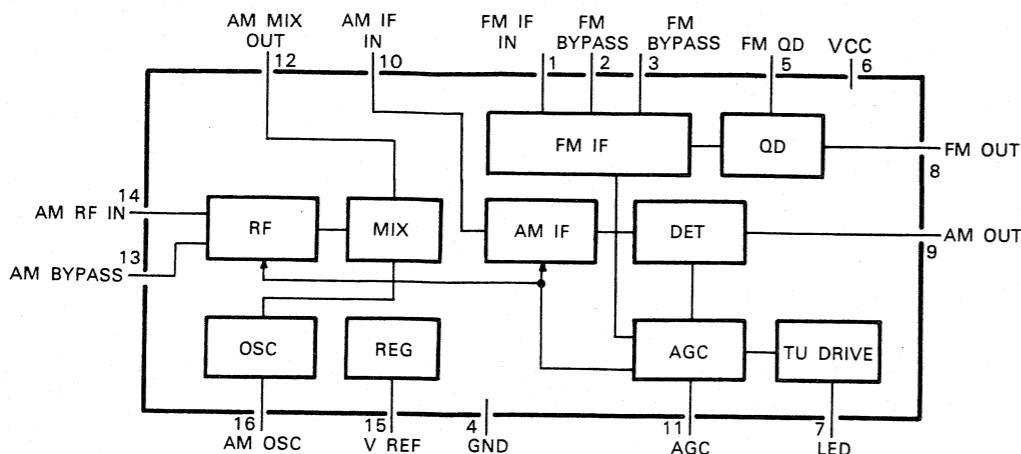
## 4. BLOK DIAGRAM

### ● For KU type



## IC DATA

## ■ IC (LA1260) PIN DESCRIPTION

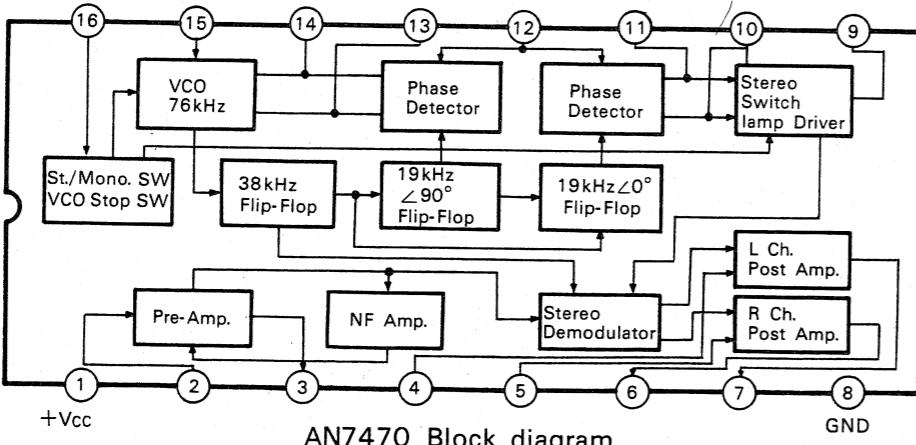


LA1260 Block diagram

Pin No.	Pin Name	Pin No.	Pin Name
1	FM-IF input	9	AM DET output
2	FM bypass capacitor connection	10	AM-IF input
3		11 <sup>2</sup>	AGC capacitor connection
4	GND	12 <sup>3</sup>	AM mix output
5	FM DET coil connection	13 <sup>4</sup>	AM bypass capacitor connection
6	VCC	14	AM RF input
7 <sup>1</sup>	LED drive terminal (TUNED)	15	Regulator output
8	FM DET output	16	AM OSC connection

- \*1: Active low.
- \*2: TUNED IND cannot be driven when the voltage of this pin becomes less than 0.9V. Accordingly, LED does not light up.
- \*3: Pin 12 is turned to FM when it is opened. When the electric potential of pin 12 is made the same as pin 6 by direct current, the AM circuit is switched ON by the internal switch.
- \*4: Pin 13 is turned to AM when it is opened. When pin 13 is grounded, the FM circuit is switched ON by the internal switch and AM circuit is switched OFF. At this time, pin 12 is connected in the same electric potential with pin 6.

## ■ IC (AN7470) PIN DESCRIPTION



AN7470 Block diagram

Pin No.	Pin Name	Pin No.	Pin Name
1	Vcc	9 <sup>1</sup>	Stereo Indicator and VCO Freq. Monitor
2	Composite Sig. Input	10, 11	Pilot Det. Low-pass Filter
3	Buffer Amp. Output	12	Pilot Signal Input
4	L Ch. Amp. Feedback	13	PLL Low-pass Filter
5	R Ch. Amp. Feedback	14	PLL Low-pass Filter
6	R Ch. Amp. Output	15	VCO RC Time Const
7	L Ch. Amp. Output	16 <sup>2</sup>	Forced Mono. VCO Killer
8	GND		

- \*1: Active low.
- \*2: VMO: ST-MONO switching voltage  
VVCO: VCO stop voltage  
  - ① STEREO-MONO automatic switching
  - ② Compulsory MONO
  - ③ VCO stop

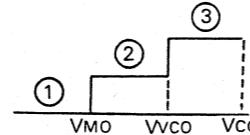


Fig. (a) Input applied to pin 16 of AN7470

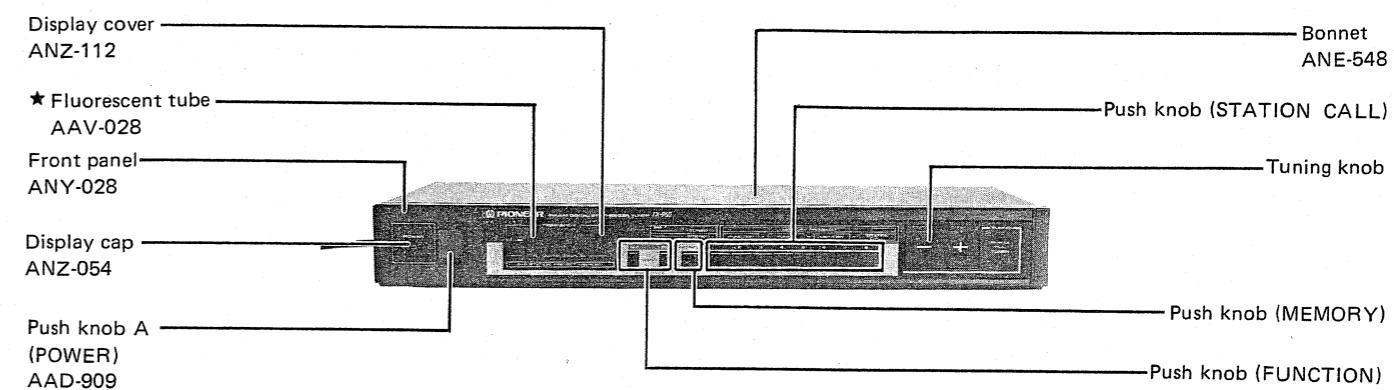
## 5. PARTS LOCATION

## ● For KU type

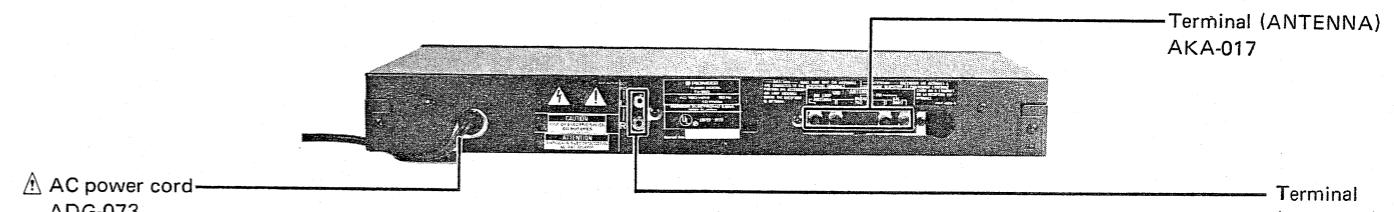
## NOTES:

- The **▲** mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- For your Parts Stock Control, the fast moving items are indicated with the marks **★★** and **★**.
- ★★ GENERALLY MOVES FASTER THAN ★**  
This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

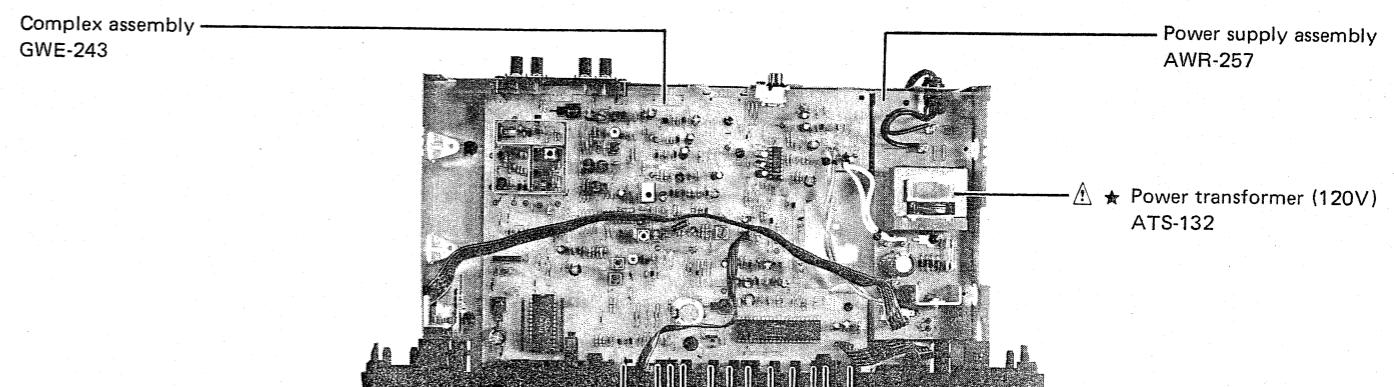
## Front Panel View



## Rear Panel View



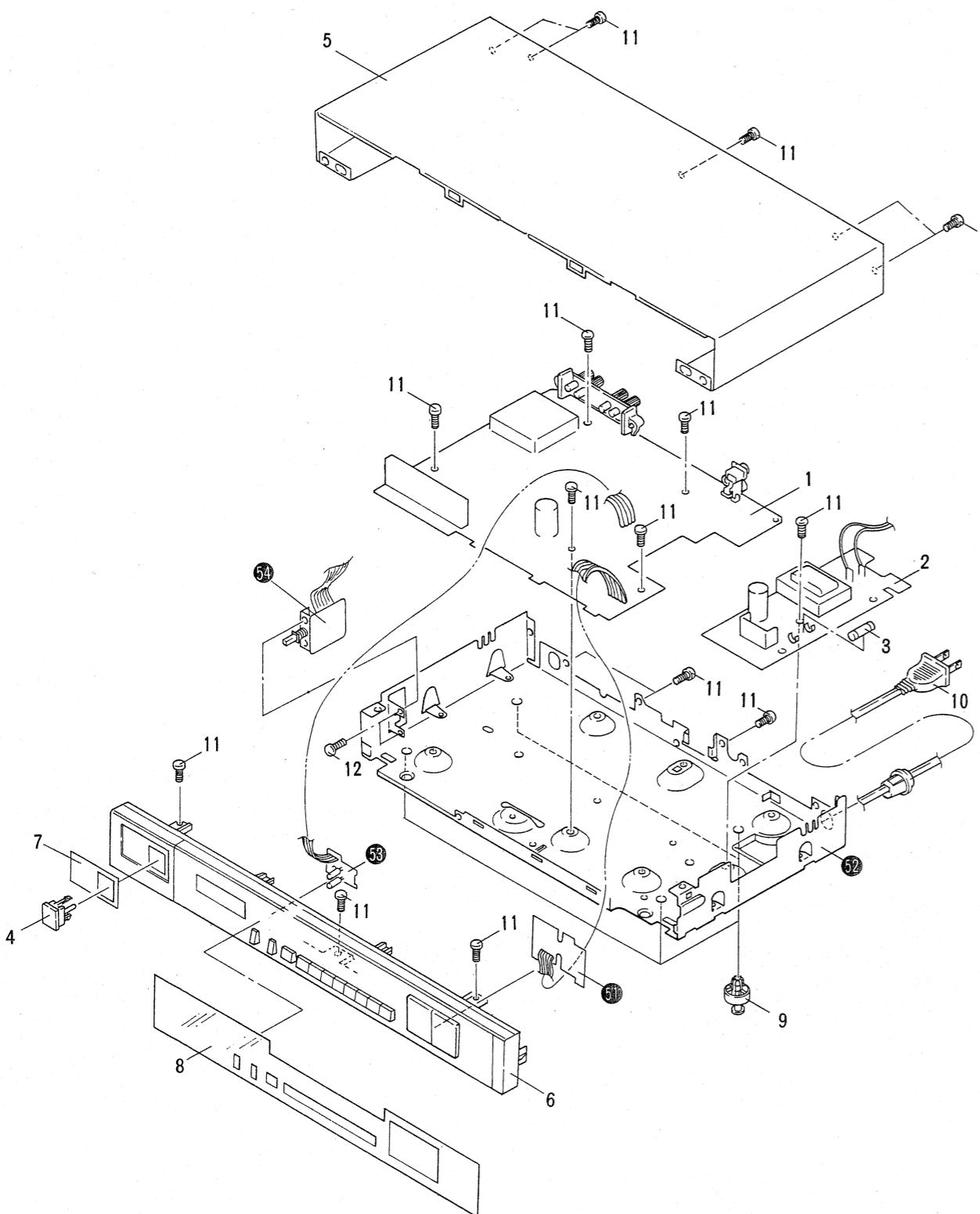
## Top View



## ★ ★ Tact switch (ASG-711)

## 6. EXPLODED VIEW

### ● For KU type



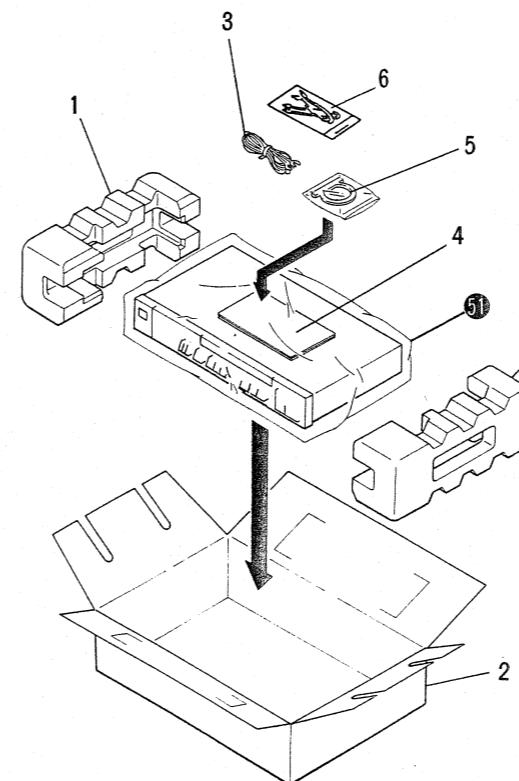
### NOTES:

- Parts without part number cannot be supplied.
- The **▲** mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
- For your Parts Stock Control, the fast moving items are indicated with the marks **★★** and **★**.
- ★★ GENERALLY MOVES FASTER THAN ★**  
This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

### Parts List of Exploded View (TX-960(BK)/KU)

Mark	No.	Part No.	Description	Mark	No.	Part No.	Description
	1	GWE-243	Compley assembly		11	BBZ30P080FZK	Screw
	2	AWR-257	Power supply assembly		12	VMZ30P060FMC	Screw
▲ ★★	3	AEK-118	Fuse (125V/0.8A)				
	4	AAD-909	Push knob A (POWER)		51		Switch assembly
	5	ANE-548	Bonnet		52		Chassis
	6	ANY-028	Front panel		53		LED assembly
	7	ANZ-054	Display cap		54		Switch assembly (POWER)
	8	ANZ-112	Display cover				
	9	AEP-016	Leg assembly				
	10	ADG-073	Power cord				

## 7. PACKING

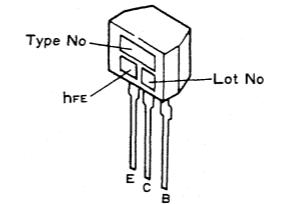


### Parts List of Packing (TX-960(BK)/KU)

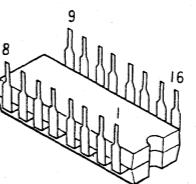
Mark	No.	Part No.	Description
1	AHA-376	Side pad	
2	AHE-597	Packing case	
3	ADH-005	FM antenna	
4	ARB-684	Operating instructions (English)	
5	ATB-102	Loop antenna assembly	
6	ADE-074	Connection cord	
51		Sheet	

External Appearance of Transistor and ICs

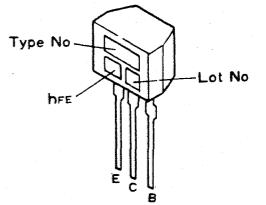
2SC2668  
2SA933S  
2SC1740S



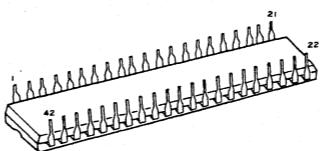
AN7470  
LA1260



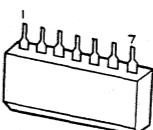
2SK161  
2SK241



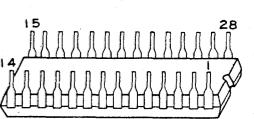
TC9157AP



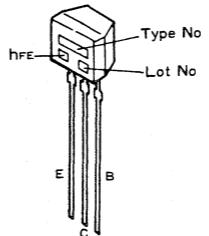
TD6104P



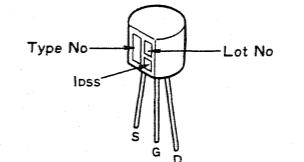
TD6301AP



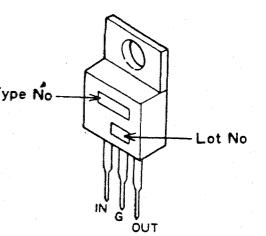
2SC2786



2SK246



$\mu$ PC78M12H



## 8. P.C.BOARDS CONNECTION DIAGRAM

● For TX-960(BK)/KU model

## TUNER ASSEMBLY (GWE-243)

3 4 5 6

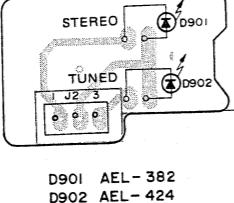
Q303 Q302 Q306 Q304 IC301 Q305 Q704 Q703 Q702 Q701 IC702 VR301 VR401

Q608 Q607 Q404 Q606 Q605 Q406 Q407 Q408 IC401 Q706 Q707

Q401 Q403 Q402 Q301 IC703 Q201 Q105 Q104 Q102 Q101 Q103 Q102 Q101

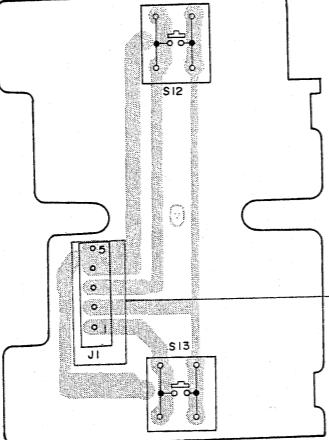
A

## LED ASSEMBLY



B

## SWITCH ASSEMBLY



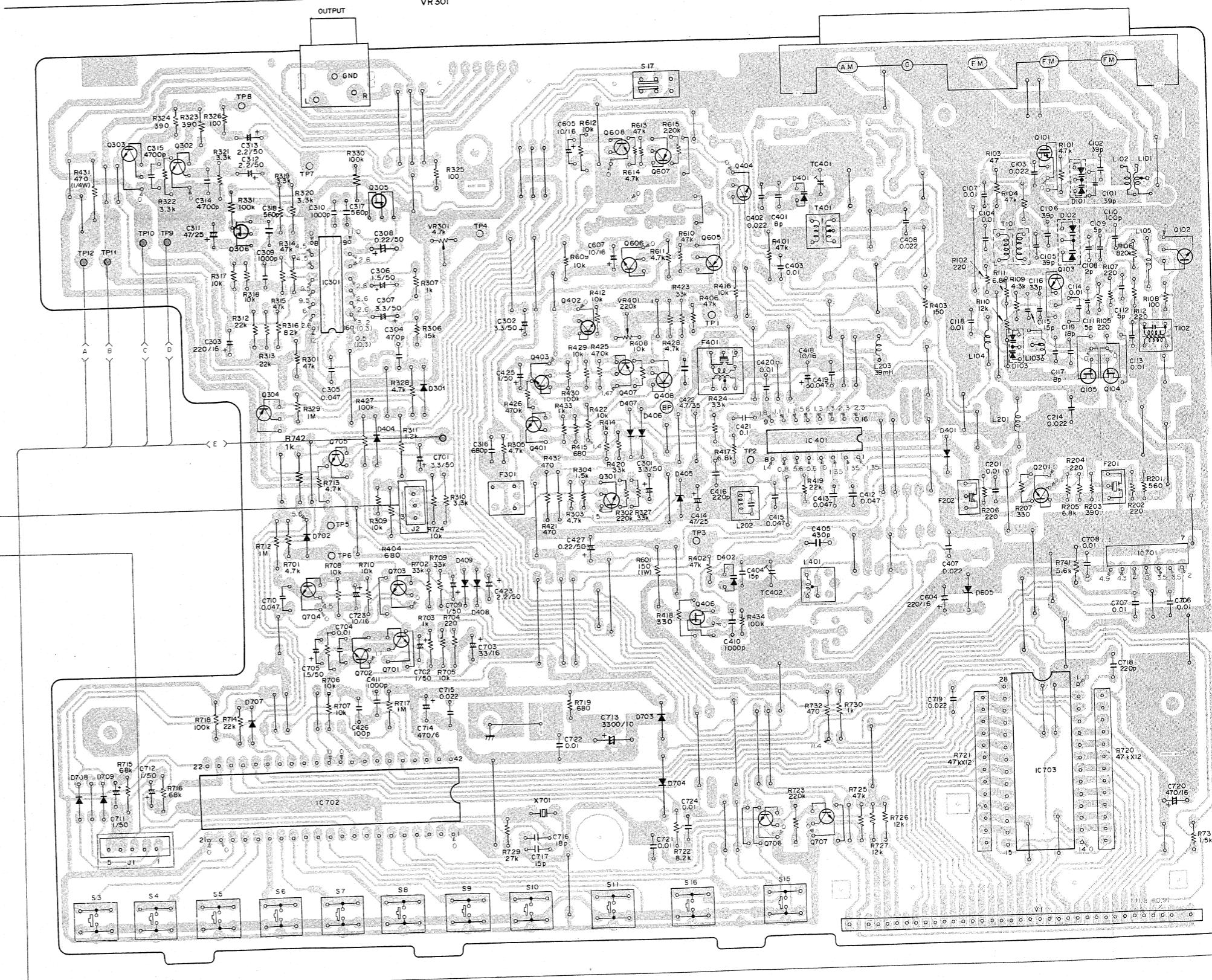
C

IC 301: AN7470  
IC 401: LA1260  
IC 701: TD6104P  
IC 702: TC9157AP  
IC 703: TD6301AP

Q101: 2SK241-Y  
Q102: 2SC2786-L  
Q103, 201:  
2SC2668  
Q104, 105, 406:  
2SK161-Y  
(2SK241-Y)  
Q 301, 302, 303  
401-404, 606, 608  
701-707:  
2SC1740S  
Q 304, 407, 408  
605, 607:  
2SA933S

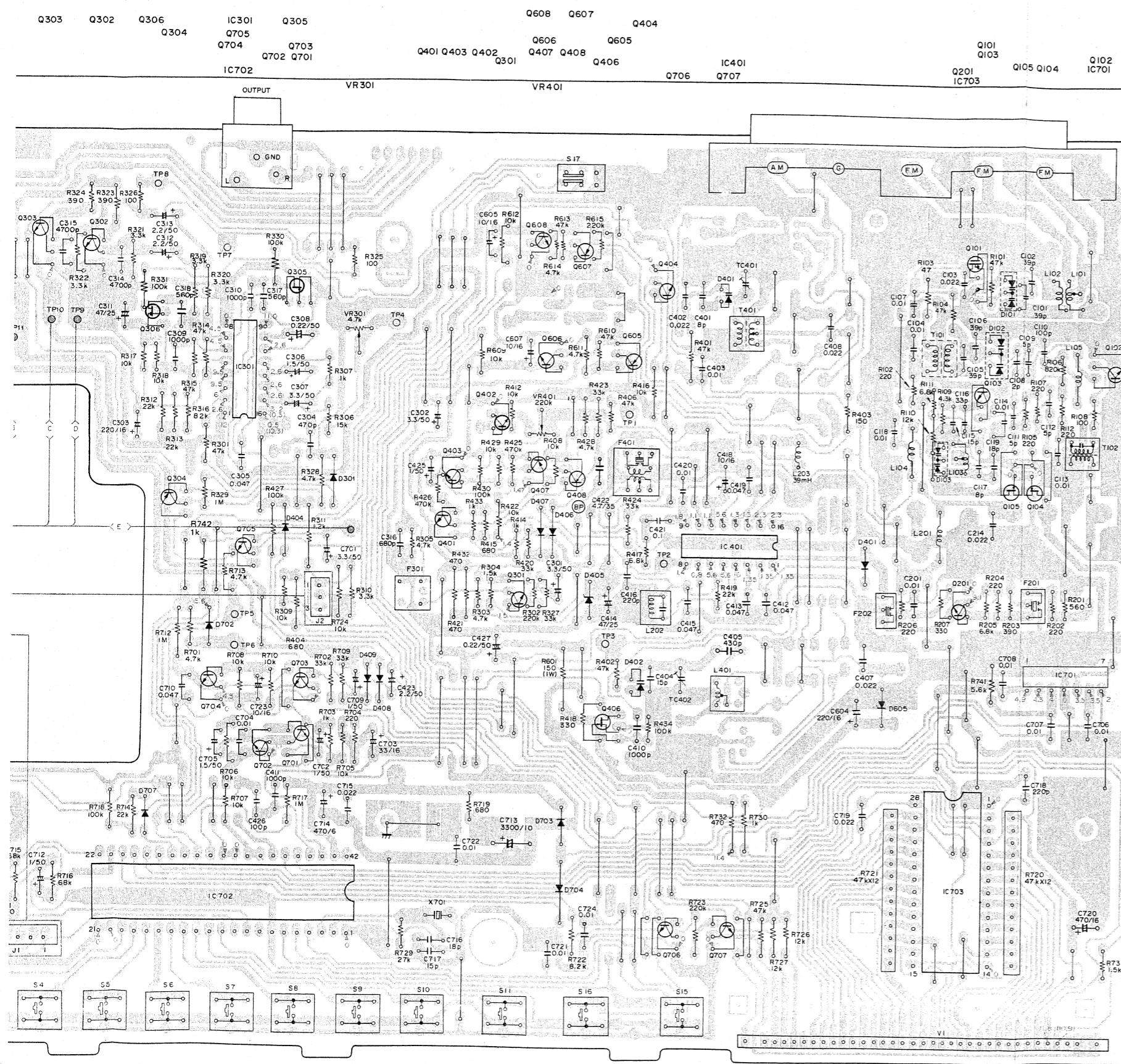
D101, 102, 103:  
ISV147  
D 301, 404, 406-410  
702 704, 707 709  
IS1555  
(US1035)  
(ISS131)

D405, 605:  
RD5.6EB  
(HZ5.6EB)  
D401, 402:  
SVC321C2/D2

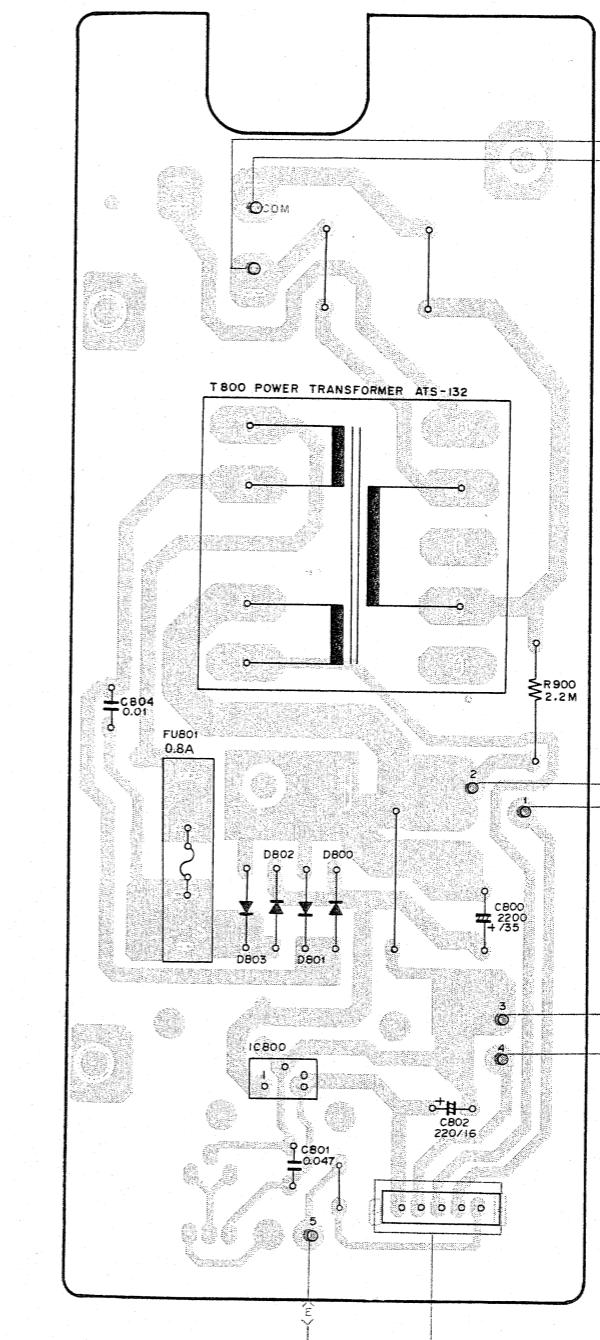


D

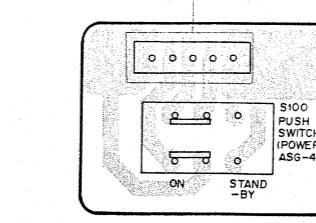
SSEMBLY (GWE-243)



POWER SUPPLY ASSEMBLY  
(AWR-257)



IC801:μPC78  
D801-804:SS



## SWITCH ASSEMBLY

A

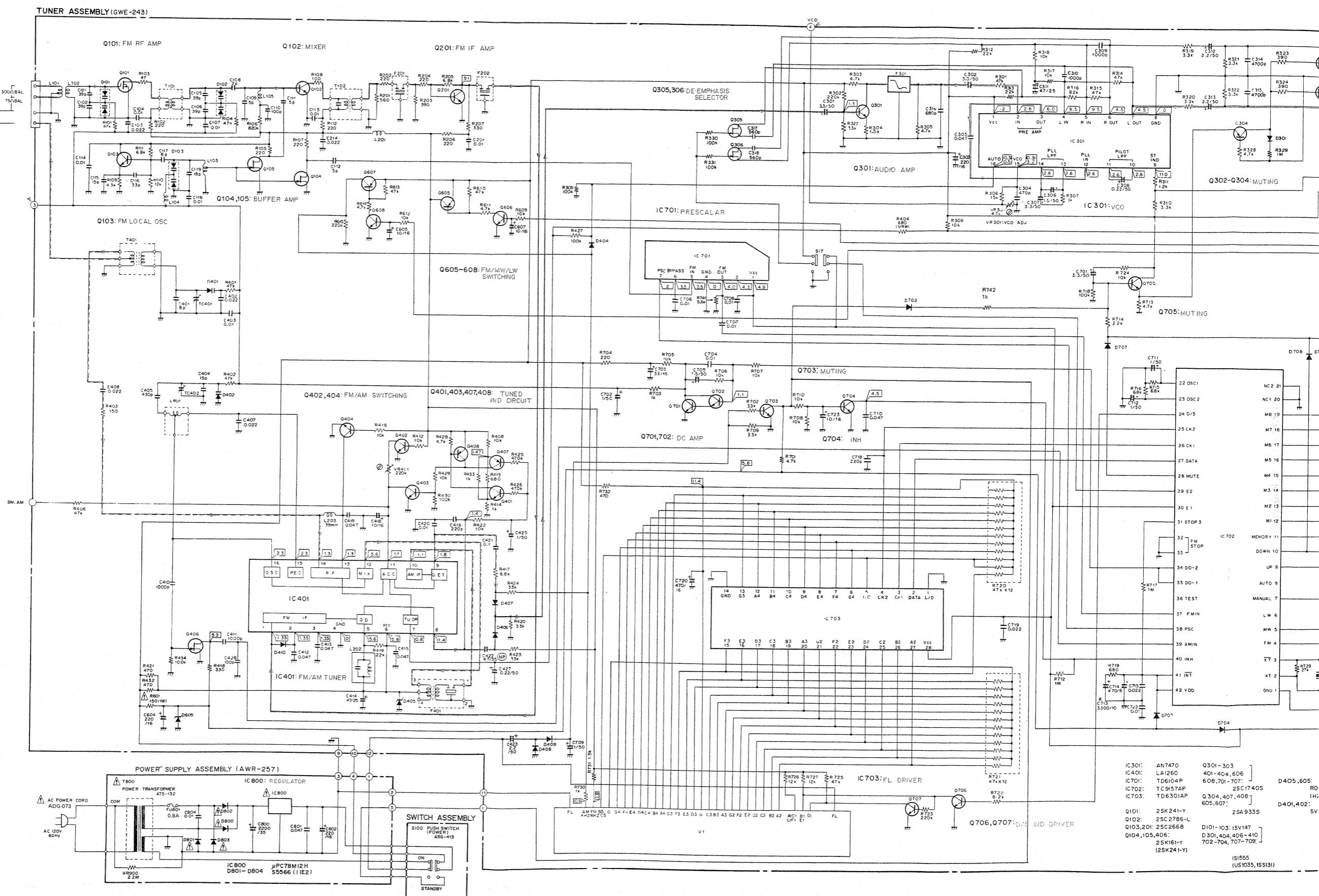
6

8

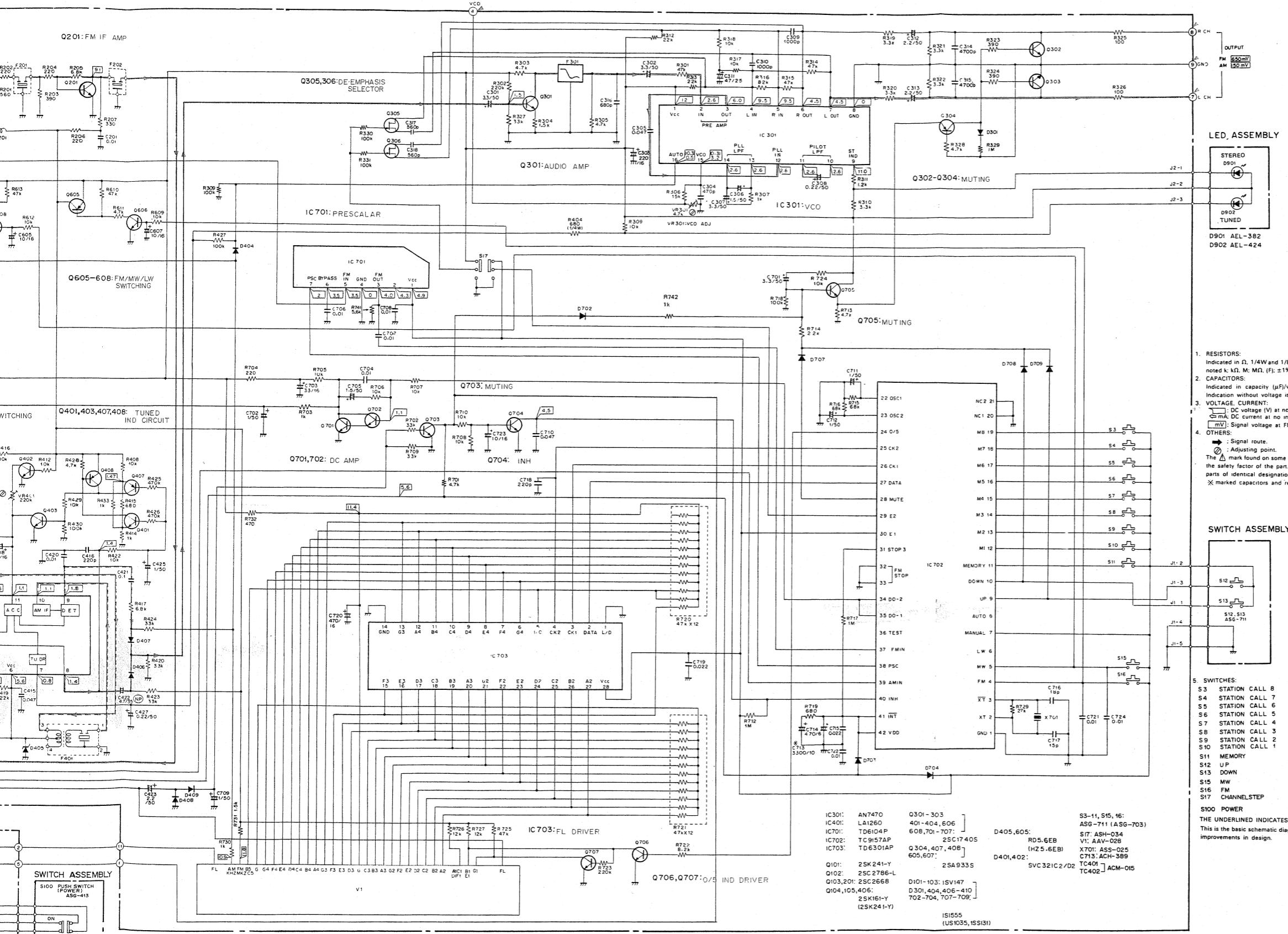
4

## 9. SCHEMATIC DIAGRAM

- For TX-960(BK)/KU model.



**NOTE:**  
The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.



## 10. ELECTRICAL PARTS LIST

### • For KU Type.

#### NOTES:

- When ordering resistors, first convert resistance values into code form as shown in the following examples.

Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%).

560Ω 56 × 10<sup>1</sup> 561 . . . . RD<sup>1</sup>PS 561 J  
47kΩ 47 × 10<sup>3</sup> 473 . . . . RD<sup>1</sup>PS 473 J  
0.5Ω 0R5 . . . . RN2H 0R5 K  
1Ω 010 . . . . RS1P 010 K

Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ 562 × 10<sup>1</sup> 5621 . . . RN<sup>1</sup>SR 5621 F

- The  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

- For your Parts Stock Control, the fast moving items are indicated with the marks **★★** and **★**.

**★★ GENERALLY MOVES FASTER THAN ★**

This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

### Miscellaneous

### SWITCHES

Mark	Symbol & Description	Part No.	Mark	Symbol & Description	Part No.
	Tuner assembly	GWE-243	★★	S3 ~ S11, S15, S16 Tact switch	ASG-711 (ASG-703)
	Switch assembly	Non supply	★★	S17 Slide switch (CHANNEL STEP)	ASH-034
	LED assembly	Non supply			
	Power supply assembly	AWR-257			
	Switch assembly (POWER)	Non supply			
	AC power cord	ADG-073			

### Tuner Assembly (GWE-243)

### SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC301	AN7470
★★	IC401	LA1260
★★	IC701	TD6104P
★★	IC702	TC9157AP
★★	IC703	TD6301AP
★★	Q304, Q407, Q408, Q605, Q607	2SA933S
★★	Q301 ~ Q303, Q401 ~ Q404, Q606, Q608, Q701 ~ Q707	2SC1740S
★★	Q103, Q201	2SC2668
★★	Q102	2SC2786-L
★★	Q104, Q105, Q406	2SK161-Y (2SK241-Y)
★★	Q101	2SK241-Y
★★	Q305, Q306	2SK246
★	D405, D605	RD5.6EB (HZ5.6EB)
★	D401, D402	SVC321C2/D2
★	D101 ~ D103	1SV147
★	D301, D404, D406 ~ D410, D702 ~ D704, D707 ~ D709	1S1555 (US1035) (1SS131)

### CAPACITORS

Mark	Symbol & Description	Part No.
C713	(3300μF/10V)	ACH-389
TC401, TC402	Trimmer	ACM-015
C716		CCCH180J50 (CCDCH180J50)
C416, C718		CCCSL221J50 (CCDSL221J50)

### RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
C117, C401		CCDCH080D50
C115, C404, C717		CCDCH150J50
C116		CCDCH330J50
C101, C102, C105, C106		CCDRH390J50
C108		CCDSL020C50
C109, C111, C112		CCDSL050C50
C110, C426		CCDSL101J50
C119		CCDTH180J50
C422		CEANP4R7M35
C308, C427		CEAR22M50L
C425, C702, C709, C711, C712		CEA010M50L
C306, C705		CEA1R5M50L
C418, C723, C605, C607		CEA100M16L
C312, C313, C423		CEA2R2M50L
C303, C604		CEA221M16L
C301, C302, C307, C701		CEA3R3M50L
C703		CEA330M16L
C311, C414		CEA470M25L
C720		CEA471M16L
C714		CEA471M6L
C309, C310, C410, C411		CKCYB102K50 (CKDYB102K50)
C314, C315		CKCYB472K50 (CKDYB472K50)
C317, C318		CKCYB561K50 (CKDYB561K50)
C316		CKCYB681K50 (CKDYB681K50)
C305, C412, C413, C419, C710		CKCYF473Z50 (CKDYF473Z50)
C415		CKCYX473M25 (CKDYX473M25)
C104, C107, C113, C114, C118, C210, C403, C420, C704, C724, C706 ~ C708, C721, C722, C103, C214, C402, C407, C408, C715, C719		CKDYF103Z50
C421		CKDYF223Z50
C405		CQMA104J50
C304		CQSA431J50
		CQSA471J50

### OTHERS

Mark	Symbol & Description	Part No.
	Terminal (ANTENNA)	AKA-017
	Terminal (OUTPUT)	AKB-093
★ V1	FL tube	AAV-028
★ X701	Crystal resonator	ASS-025

### Switch Assembly

### SWITCHES

Mark	Symbol & Description	Part No.
★★	S12, S13	ASG-711 (ASG-703)

### LED Assembly

### SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★	D901	AEL-382
★	D902	AEL-424

### Power Supply Assembly (AWR-257)

### SEMICONDUCTORS

Mark	Symbol & Description	Part No.
△ ★	IC800	μPC78M12H
△ ★	D800 ~ D803	S5566 (11E2)

### TRANSFORMER

Mark	Symbol & Description	Part No.
△	★ T800 Power transformer (120V)	ATS-132

## CAPACITORS

Mark	Symbol & Description	Part No.
C800		CEAS222M35
C802		CEA221M16L
C801		CKDYF473Z50
C804		CKDYF103Z50

## RESISTOR

Mark	Symbol & Description	Part No.
R900	(2.2MΩ)	ACN-209

## OTHER

Mark	Symbol & Description	Part No.
	Screw	PBZ30P060FMC

## Switch Assembly (POWER)

Mark	Symbol & Description	Part No.
⚠ ★★	S100 Push switch (POWER)	ASG-413

## 11. ADJUSTMENTS

## FM Tuner Section Adjustment

- Connect up as indicated in Fig. 11-1.
- Press the FM key to set FM mode.

Note: Stereo modulation: Main 1 kHz L+R±68.25 Hz dev.  
Pilot 19 kHz±6.75 kHz dev.

Step No.	FM SG (1 kHz ± 75 kHz dev.)		TX-960 tuned (TX-960L) frequency display	Adjustment	
	Frequency(MHz)	Level (dB)		Adjustment location	Specifications
1	No input signal	87.5 MHz	—	Check pin 3 (3.4V±1.5V) of tuner assembly.	
2		108.0 MHz	—	Check pin 3 (8.7V <sup>+2.5</sup> <sub>-2.0</sub> ) of tuner assembly.	
3	98.0	20—30	98.0 MHz	T101, T102	Set the output from pin 1 of the tuner assembly to maximum level. (Before performing the adjustment of Step 3, turn VR401 fully counterclockwise.)
4	98.0	60	98.0 MHz	L202	Set pin 2 of tuner assembly to 1.4V (±0.01V).
5	98.0	80	98.0 MHz	VR401	Set pin 1 of tuner assembly to 1.1V (±0.01V).
6	98.0	0	98.0 MHz	—	Check pin 1 of tuner assembly below 0.8V.
7	98.0	80	98.0 MHz	VR301	Adjust the frequency at pin 4 of tuner assembly to 76kHz (±150 Hz).
8	98.0	60	98.0 MHz	T102	Minimize distortion in both left and right channel outputs (adjust T102 to within ± 90°).
	Stereo modulation (note)		98.0 MHz	Confirm that the TUNED IND and STEREO IND light up when the level of FM SG is turned to high, and that the TUNED IND and STEREO IND light off when the level of the FM SG is turned to low.	
	Stereo modulation (note)		98.0 MHz		

## AM (MW) Tuner Section Adjustment

- Connect up as indicated in Fig. 11-2.
- Press the AM (MW) key to set AM (MW) mode.
- Set the AM CHANNEL STEP switch to the 9 kHz position. (TX-960/KU only)

Step No.	AM SG (400 Hz, 30% modulation)		TX-960 tuned (TX-960L) frequency display	Adjustment	
	Frequency (kHz)	Level (dB)		Adjustment location	Specifications
1	No input signal	531 kHz	L401	Set pin 3 of tuner assembly to 1.3V (±0.1V).	
2		1602 kHz	TC402	Set pin 3 of tuner assembly to 10.0V (±0.3V).	
3	Repeat steps 1 and 2 until both specification ratings are satisfied.				
4	603	40	603 kHz	T401	Set the output from pin 1 of the tuner assembly to maximum level.
5	1395	40	1395 kHz	TC401	
6	Repeat steps 4 and 5 until both specification ratings are satisfied.				
7	1395	Variable	1395 kHz	Check that the TUNING indicator comes on when the AM SG level is gradually increased.	

## AM (LW) Tuner Section Adjustment (TX-960L only)

- Connect up as indicated in Fig. 11-2.
- Press the AM (LW) key to set AM (LW) mode.

Step No.	AM SG (400 Hz, 30% modulation)		TX-960L tuned frequency display	Adjustment	
	Frequency(kHz)	Level (dB)		Adjustment location	Specifications
1	No input signal		281 kHz	L503	Set pin 3 of tuner assembly to 5.2V (±0.1V).
2	164	40	164 kHz	T501	Set the output from pin 1 of the tuner assembly to maximum level.
3	254	40	254 kHz	TC501	
4	Repeat steps 2 and 3 until both specification ratings are satisfied.				

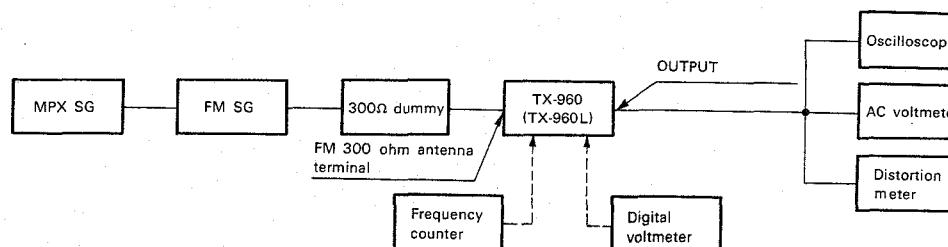


Fig. 11-1. FM adjustment connection diagram

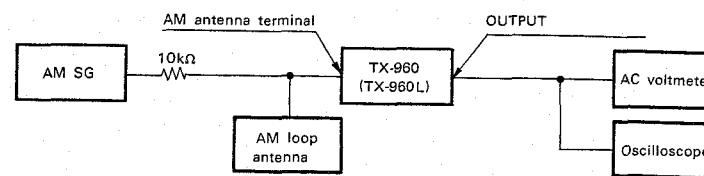


Fig. 11-2. AM adjustments connection diagram

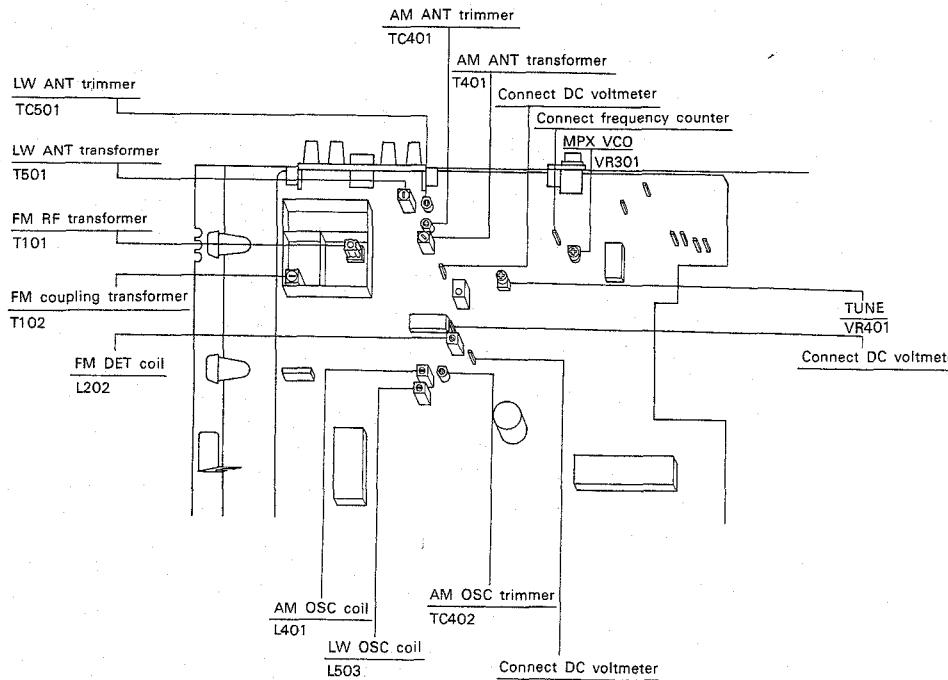


Fig. 11-3. Adjustment positions

## 11. RÉGLAGE

### Réglage de la partie syntoniseur MF

- Faire les raccordements comme indiqué en Fig. 11-1. Note: Modulation stéréo: Principal 1kHz L+R  $\pm$  68,25kHz dév. Pilote 19kHz  $\pm$  6,75kHz dév.
- Enfoncer la touche MF pour régler en mode MF.

Etape N°	FM SG (1kHz, $\pm$ 75kHz dév.)		Affichage de fréquence syntonisée TX-960 (TX-960L)	Réglage	
	Fréquence (MHz)	Niveau (dB)		Lieu de réglage	Caractéristiques
1	Pas de signal d'entrée		87,5 MHz	—	Vérifier la fiche 3 (3,4V $\pm$ 1,5V) de l'ensemble syntoniseur.
			108,0 MHz		Vérifier la fiche 3 (8,7V $\pm$ 2,5V) de l'ensemble syntoniseur.
3	98,0	20 à 30	98,0 MHz	T101, T102	Régler la puissance de la fiche 1 de l'ensemble syntoniseur au niveau maximal. (Avant d'effectuer le réglage de l'Etape 3, tourner VR401 à fond dans le sens horaire inversé.)
4	98,0	60	98,0 MHz	L202	Régler la fiche 2 de l'ensemble syntoniseur à 1,4V ( $\pm$ 0,01V).
	80	Pas de modulation	VR401	Régler la fiche 1 de l'ensemble syntoniseur à 1,1V ( $\pm$ 0,01V).	
5	98,0	0	98,0 MHz	—	Vérifier si la fiche 1 de l'ensemble syntoniseur est en-dessous de 0,8V.
6	98,0	80	98,0 MHz	VR301	Régler la fréquence de la fiche 4 de l'ensemble syntoniseur à 76 kHz ( $\pm$ 150Hz).
7	98,0	60	98,0 MHz	T102	Réduire la distorsion dans les sorties des deux canaux droit et gauche (régler T102 à $\pm$ 90°).
8	98,0	Variable	98,0 MHz	Confirmer que le TUNED IND et le STEREO IND s'allument lorsque le niveau de FM SG est syntonisé trop haut, et que le TUNED IND et STEREO IND sont éteints lorsque le niveau de FM SG est syntonisé trop bas.	

### Réglage de la partie syntoniseur MA (MW)

- Faire les raccordements comme indiqué en Fig. 11-2.
- Enfoncer la touche MA (MW) pour régler en mode MA (MW).
- Régler le commutateur MA CHANNEL STEP en 9ème position. (TX-960/KU uniquement)

Etape N°	AM SG (400Hz, 30% modulation)		Affichage de fréquence syntonisée TX-960 (TX-960L)	Réglage		
	Fréquence (kHz)	Niveau (dB)		Lieu de réglage	Caractéristiques	
1	Pas de signal d'entrée		531 kHz	L401	Régler la fiche 3 de l'ensemble syntoniseur à 1,3V ( $\pm$ 0,1V).	
			1602 kHz	TC402	Régler la fiche 3 de l'ensemble syntoniseur à 10,0V ( $\pm$ 0,3V).	
3	Répéter les Etapes 1 et 2 jusqu'à ce que les taux nominaux préconisés soient atteints.					
4	603	40	603 kHz	T401	Régler la puissance de la fiche 1 de l'ensemble syntoniseur au niveau maximal.	
5	1395	40	1395 kHz	TC401		
6	Répéter les Etapes 4 et 5 jusqu'à ce que les taux nominaux préconisés soient atteints.					
7	1395	Variable	1395 kHz	Vérifier si l'indicateur TUNING s'allume lorsque le niveau de AM SG augmente graduellement.		

### Réglage de la partie syntoniseur MA (LW) (TX-960L uniquement)

- Faire les raccordements comme indiqué en Fig. 11-2.
- Enfoncer la touche MA (LW) pour régler en mode MA (LW).

Etape N°	AM SG (400Hz, 30% modulation)		Affichage de fréquence syntonisée TX-960L	Réglage	
	Fréquence (kHz)	Niveau (dB)		Lieu de réglage	Caractéristiques
1	Pas de signal d'entrée		281 kHz	L503	Régler la fiche 3 de l'ensemble syntoniseur à 5,2V ( $\pm$ 0,1V).
2	164	40	164 kHz	T501	Régler la puissance de la fiche 1 de l'ensemble syntoniseur au niveau saximal.
3	254	40	254 kHz	TC501	
4	Répéter les Etapes 2 et 3 jusqu'à ce que les taux nominaux préconisés soient atteints.				

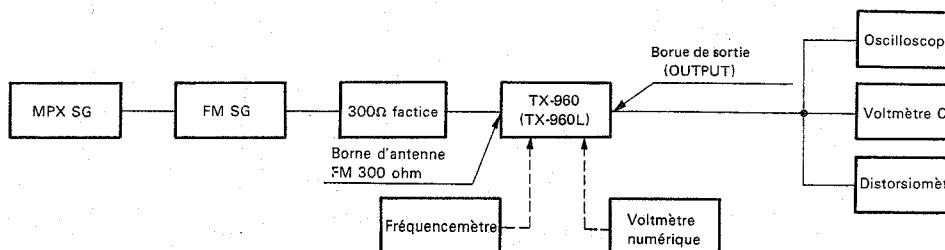


Fig. 11-1 Diagramme de raccordement de réglage MF

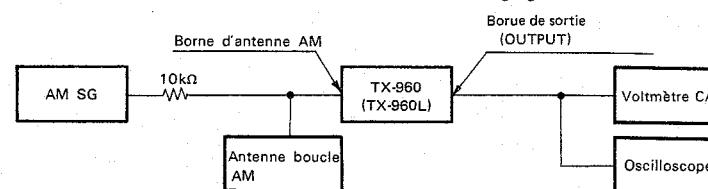


Fig. 11-2 Diagramme de raccordement de réglage MA

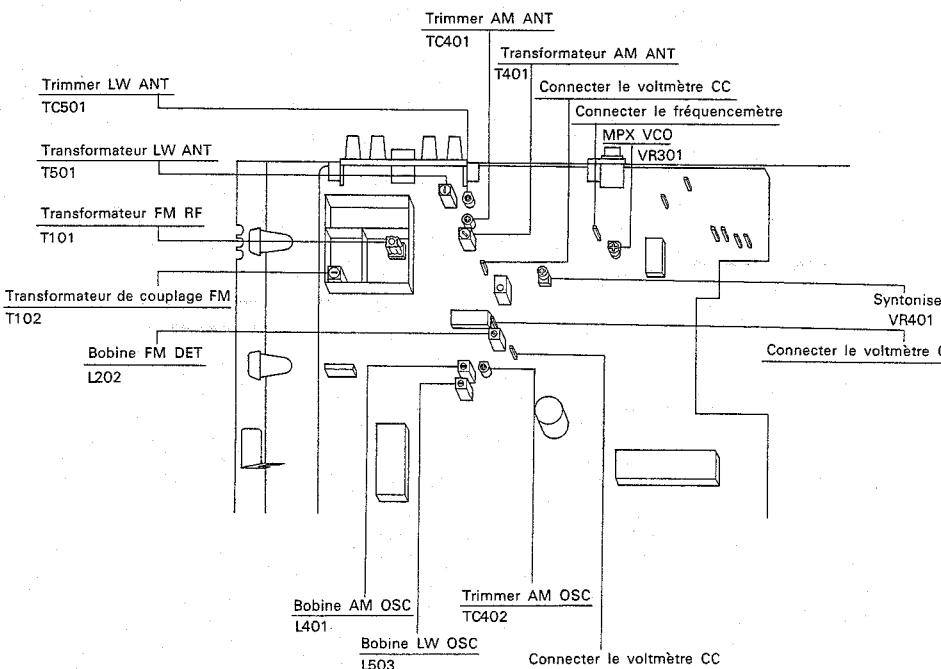


Fig. 11-3 Positions de réglage

## 11. AJUSTE

### Ajuste de la sección del sintonizador de FM

- Conecte como es indicado en la Fig. 11-1.
- Oprima la tecla de FM para fijar el modo de FM.

Nota: Modulación estero: Principal 1 kHz L+R  $\pm$  68,25 kHz dev. Piloto 19kHz  $\pm$  6,75 kHz dev.

No. de paso	FM SG (1 kHz, $\pm$ 75 kHz dev.)			Visualización de frecuencia sintonizada TX-960 (TX-960L)	Lugar de ajuste	Ajuste
	Frecuencia (MHz)	Nivel (dB)	Especificaciones			
1	No hay señal de entrada	87,5 MHz	—	98,0 MHz	T101, T102	Inspeccione la patilla 3 del conjunto del sintonizador (3,4 $\pm$ 1,5V).
2		108,0 MHz	—			Inspeccione la patilla 3 del conjunto del sintonizador (8,7V $\pm$ 2,0V).
3	98,0	20 a 30	98,0 MHz	L202	VR401	Fije la salida de la patilla 1 del conjunto del sintonizador al máximo nivel. (Antes de efectuar ajuste del paso 3, gire VR401 completamente en contra del sentido de las manecillas del reloj).
4		60	98,0 MHz			Fije la patilla 2 del conjunto del sintonizador a 1,4V $\pm$ 0,01V.
5		80	98,0 MHz			Fije la patilla 1 del conjunto del sintonizador a 1,1V ( $\pm$ 0,01V).
	0	—	—	—	—	Inspeccione la patilla 1 del conjunto del sintonizador que está abajo de 0,8V.
6	98,0	80	98,0 MHz	VR301	—	Ajuste la frecuencia en la patilla 4 del conjunto del sintonizador a 76kHz ( $\pm$ 150Hz).
7	98,0	60	98,0 MHz	T102	—	Reduzca la distorsión tanto en la salida del canal izquierdo como en el derecho (ajuste T102 a dentro de $\pm$ 90°).
8	98,0	Variable	98,0 MHz	—	—	Confirme que se enciendan el IND STEREO y el IND TUNED cuando el nivel de FM SG es girado a alto, y que los anteriores IND STEREO y IND TUNED se apagan cuando el nivel de FM SG es girado a bajo.

### Ajuste de la sección del sintonizador de AM (MW)

- Conecte como es indicado en la Fig. 11-2.
- Oprima la tecla AM (MW) para fijar el modo AM (MW).
- Fije el interruptor de AM CHANNEL STEP (paso de canal de AM) a la posición de 9 kHz. (Solo TX-960/KU)

No. de AM SG (400 Hz, 30% modulación)	Visualización de frecuencia sintonizada TX-960 (TX-960L)			Lugar de ajuste	Ajuste	
	Frecuencia (kHz)	Nivel (dB)	Especificaciones			
1	No hay señal de entrada	531 kHz	—	L401	Fije la patilla 3 del conjunto del sintonizador a 1,3V ( $\pm$ 0,1V).	
2		1602 kHz	—		TC402	Fije la patilla 3 del conjunto del sintonizador a 10,0V ( $\pm$ 0,3V).
3	603	40	603 kHz	T401	Fije la salida de la patilla 1 del conjunto del sintonizador al máximo nivel.	
4						
5	1395	40	1395 kHz	TC401		
6						
7	1395	Variable	1395 kHz	—	Inspeccione que el indicador de TUNING (sintonización) se encienda cuando se aumenta gradualmente el nivel de AM SG.	

### Ajuste de la sección del sintonizador de AM (LW). (Solo TX-960L)

- Conecte como es indicado en la Fig. 11-2.
- Oprima la tecla AM (LW) para fijar el modo AM (LW).

No. de AM SG (400 Hz, 30% modulación)	Visualización de frecuencia sintonizada TX-960L			Lugar de ajuste	Ajuste
	Frecuencia (kHz)	Nivel (dB)	Especificaciones		
1	No hay señal de entrada	281 kHz	—	L503	Fije la patilla 3 del conjunto del sintonizador a 5,2V ( $\pm$ 0,1V).
2		164	40		TC501
3	254	40	254 kHz	TC501	
4					

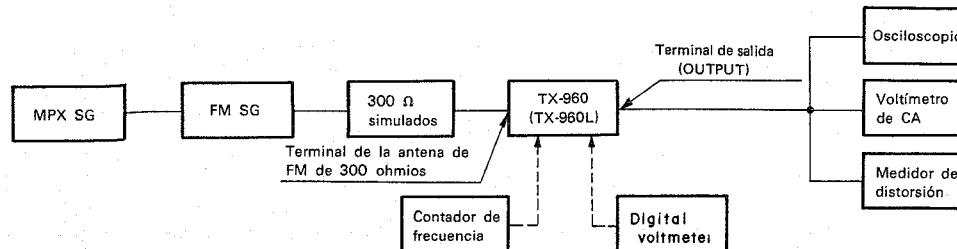


Fig. 11-1 Diagramma de conexión de ajuste de FM

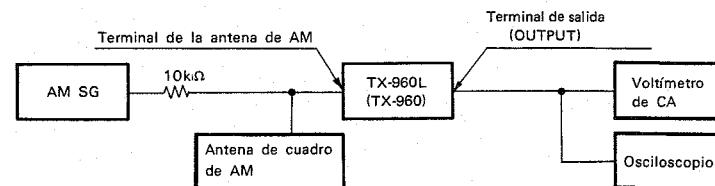


Fig. 11-2 Diagramma de conexión de ajuste de AM

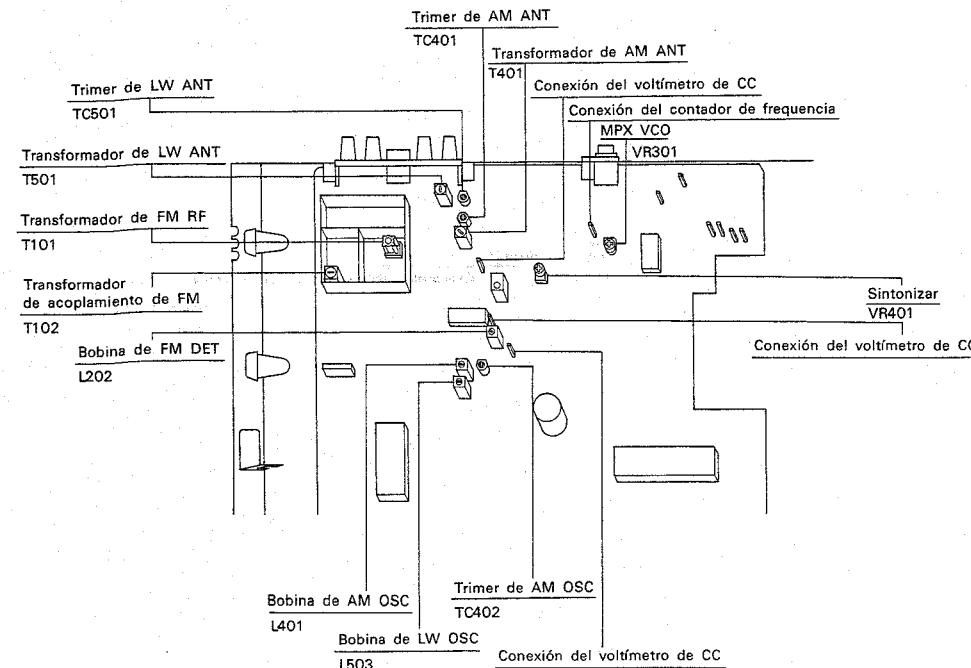


Fig. 11-3 Puntos de ajuste

## 12. FOR HE AND HB TYPES

### Contrast of Miscellaneous Parts

The TX-960L(BK)/HE, HB and TX-960L/HE, HB are the same as the TX-960(BK)/KU with the exception of the following sections

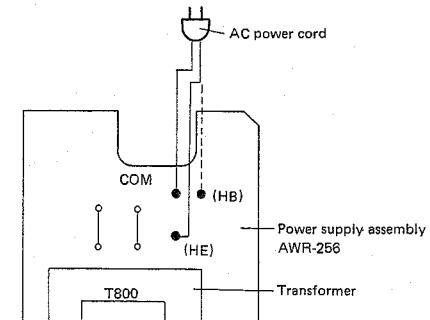
Mark	Symbol & Description	Part No.				
		TX-960(BK)/KU	TX-960L(BK)/HE	TX-960L(BK)/HB	TX-960L/HE	TX-960L/HB
★★	Tuner assembly	GWE-243	GWE-241	GWE-241	GWE-241	GWE-241
★★	Power supply assembly	AWR-257	AWR-256	AWR-256	AWR-256	AWR-256
	Fuse (FU801: 0.8A/125V)	AEK-118	...	...	...	...
	Fuse (FU801: T400mA/250V)	AEK-407	ANE-548	AEK-504	ANE-548	AEK-407
	Bonnet	ANE-548	ANE-548	ANE-557	ANE-557	ANE-557
	Front panel	ANY-028	ANM-950	ANM-950	ANM-955	ANM-955
	Display cover	ANZ-112	ANZ-053	ANZ-053	ANZ-067	ANZ-067
	Operating instructions (English)	ARB-684	...	ARB-684	...	ARB-684
	Operating instructions (English/German/French/Italian)	...	ARE-151	...	ARE-151	...
▲	Packing case	AHE-597	AHE-522	AHE-522	AHE-532	AHE-532
	AC power cord	ADG-073	ADG-073	ADG-073	ADG-071	ADG-078

### Line Voltage Selection

Line voltage can be changed with following steps.

1. Disconnect the AC power cord.
2. Remove the top cover.
3. Change the connection of the power supply assembly (AWR-256) primary pins.
4. Stick the line voltage label on the rear panel.

Part No.	Description
AAX-193	220V label
AAX-192	240V label





## Power Supply Assembly (AWR-256)

## SEMICONDUCTORS

Mark	Symbol & Description	Part No.
△ ★★	IC800	μPC78M12H
△ ★	D800 ~ D803	S5566 (11E2)

## TRANSFORMER

Mark	Symbol & Description	Part No.
△ ★	T800 Power transformer (220V/240V)	ATS-096

## CAPACITORS

Mark	Symbol & Description	Part No.
C800		CEAS222M35
C802		CEA221M16L
C801		CKDYF473Z50
C804		CKDYF103Z50

## OTHER

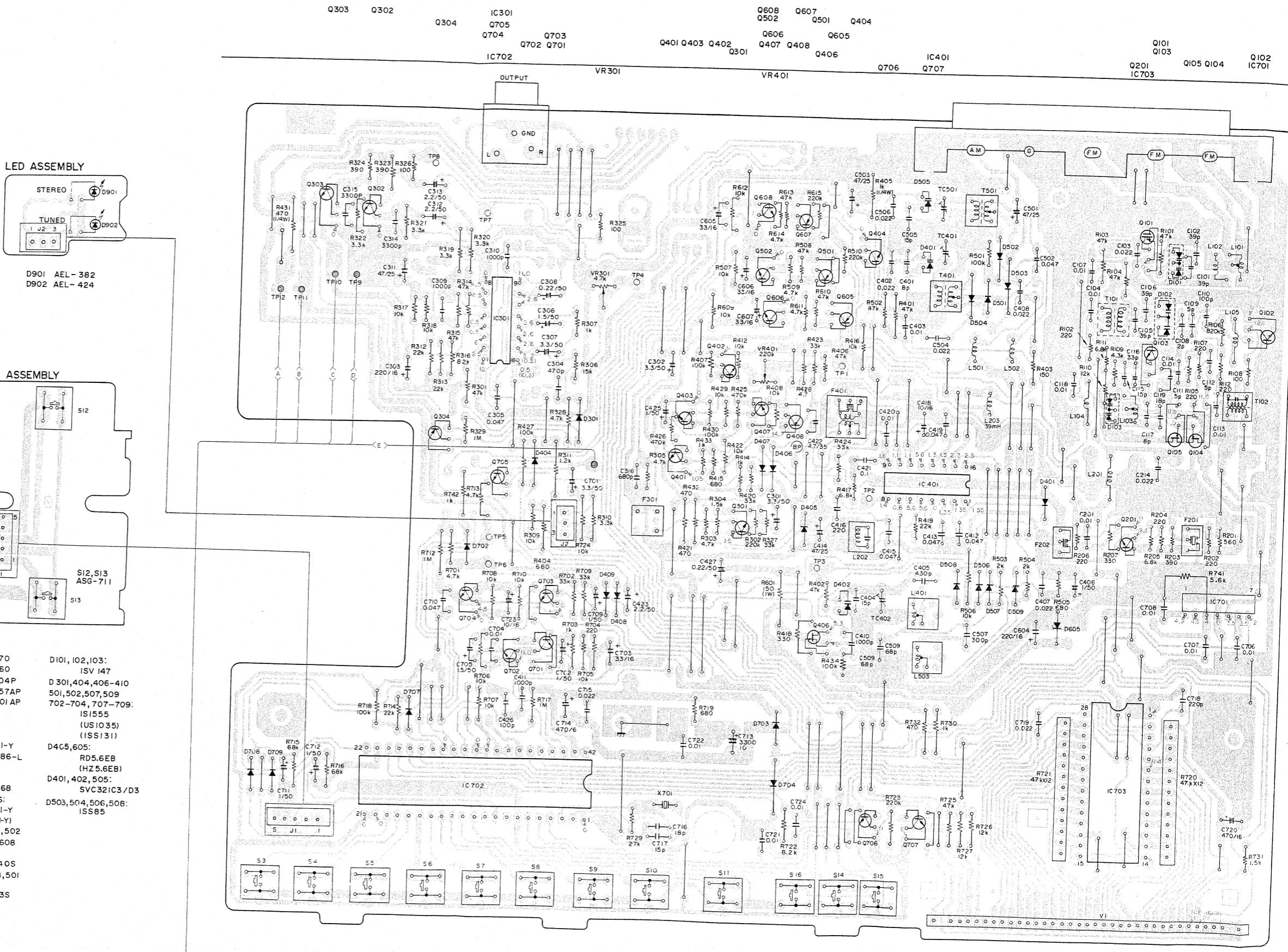
Mark	Symbol & Description	Part No.
	Screw	PBZ30P060FMC



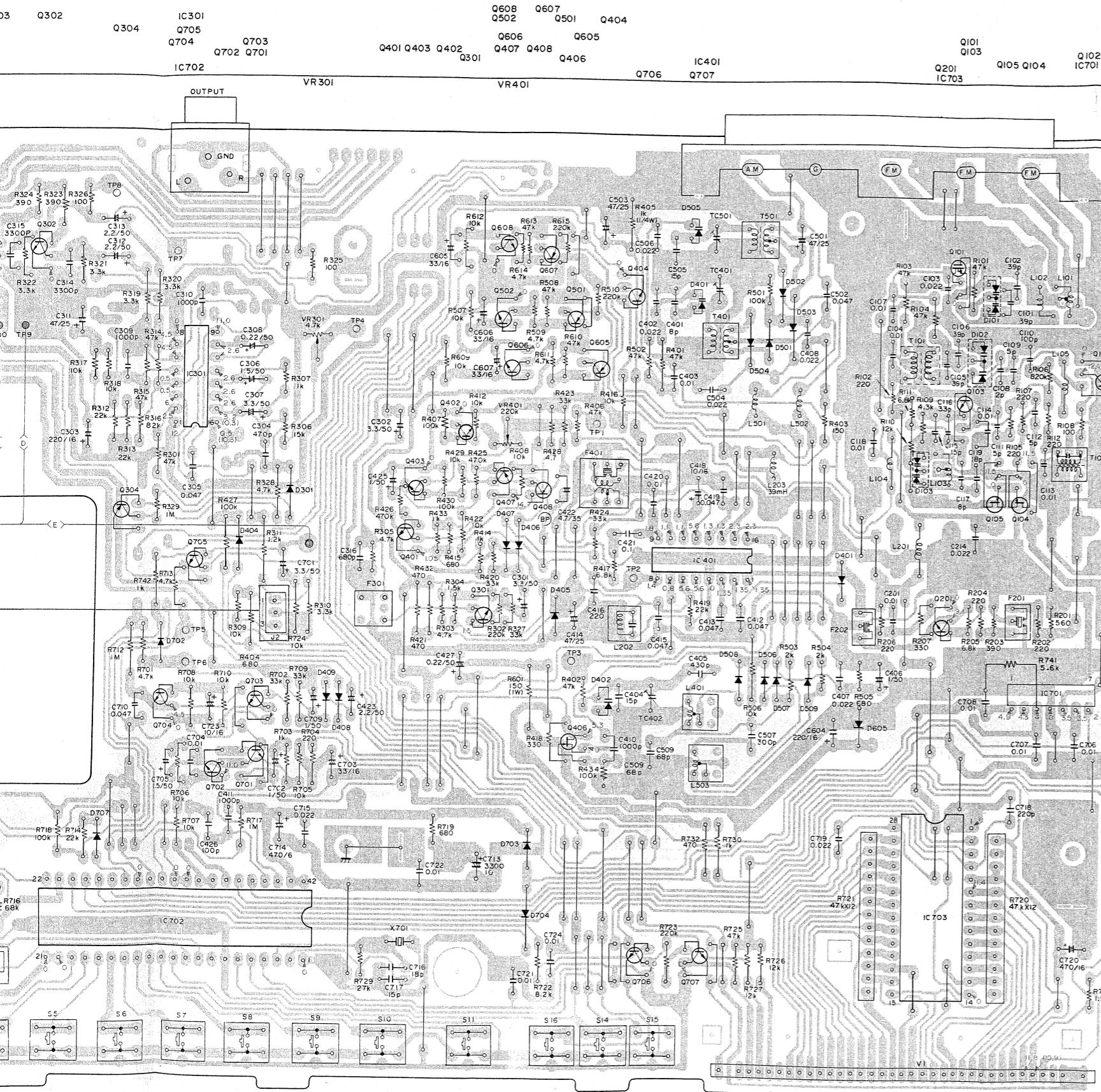
## P.C. BOARDS PATTERNS

- For TX-960L(BK)/HE, HB and TX-960L/HE, HB models.

## TUNER ASSEMBLY(GWE-241)

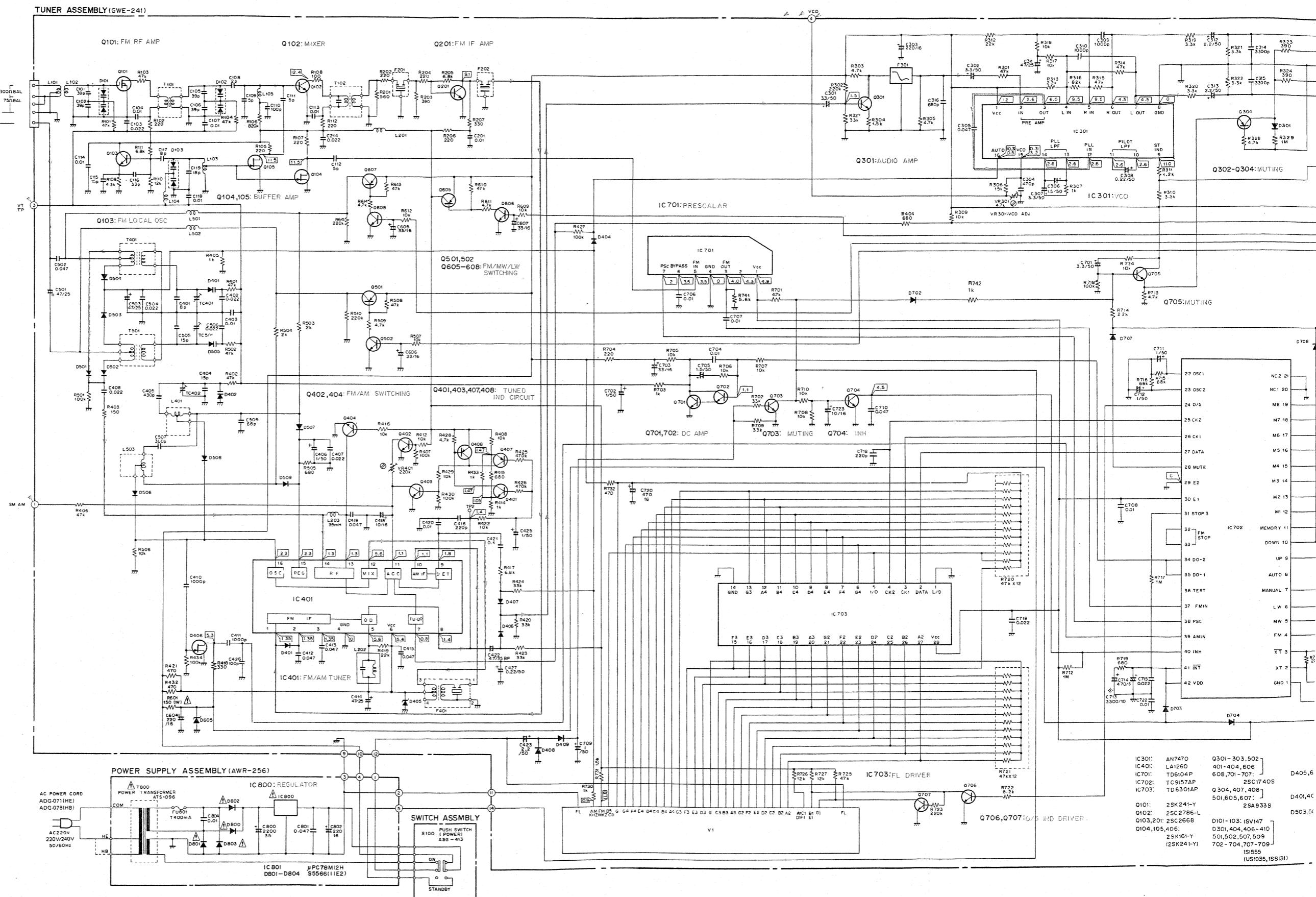


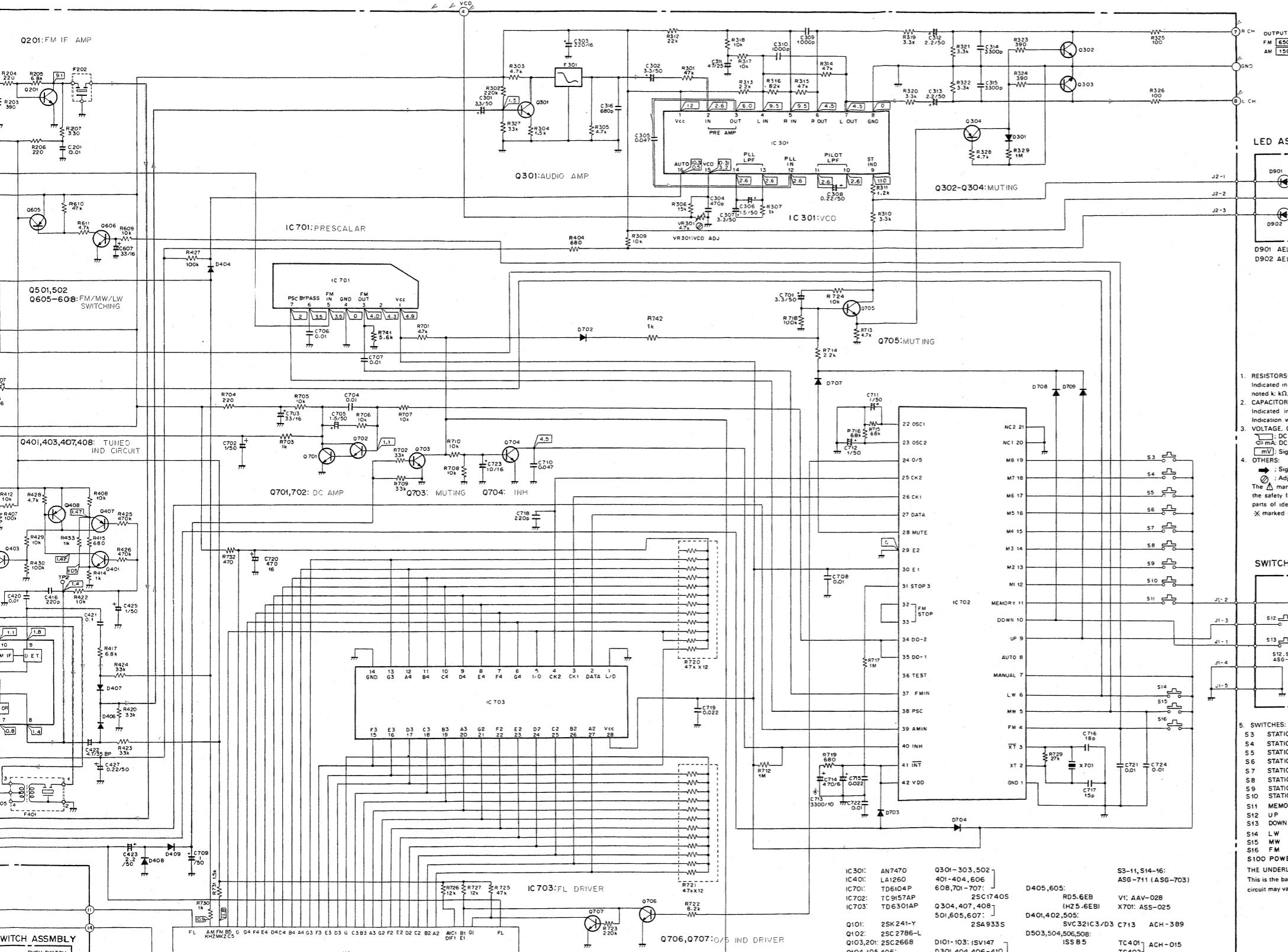
IBLY(GWE-241)



## SCHEMATIC DIAGRAM

- For TX-960L(BK)/HE, HB and TX-960L/HE, HB models.

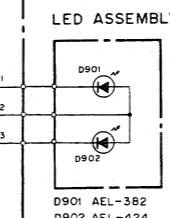




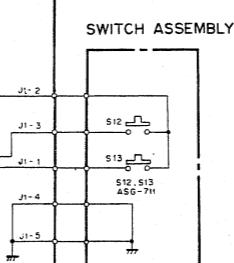
## NOTE:

The indicated semiconductors are representative ones only. Other alternative semiconductors may be used and are listed in the parts list.

A



1. RESISTORS: Indicated in  $\Omega$ . 1/4W,  $\pm 5\%$  tolerance unless otherwise noted; k: KO, M: MO, (F):  $\pm 1\%$ , (G):  $\pm 2\%$ , (K):  $\pm 10\%$ , (M):  $\pm 20\%$  tolerance.
2. CAPACITORS: Indicated in capacity ( $\mu\text{F}$ )/voltage (V) unless otherwise noted; p: pF. Indication without voltage is 50V except electrolytic capacitor.
3. VOLTAGE, CURRENT:  $\square$ : DC voltage (V) at no input signal.  $\square$ : mA: DC current at no input signal.  $\square$ : mV: Signal voltage at FM 1kHz  $\pm$  75 kHz DEV.
4. OTHERS:  $\rightarrow$ : Signal route.  $\odot$ : Adjusting point. The  $\Delta$  mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.  $\times$  marked capacitors and resistors have parts.unnumbers.



5. SWITCHES:
 

S1	STATION CALL 8	NORMAL	OFF
S4	STATION CALL 7	NORMAL	OFF
S5	STATION CALL 6	NORMAL	OFF
S6	STATION CALL 5	NORMAL	OFF
S7	STATION CALL 4	NORMAL	OFF
S8	STATION CALL 3	NORMAL	OFF
S9	STATION CALL 2	NORMAL	OFF
S10	STATION CALL 1	NORMAL	OFF
S11	MEMORY	NORMAL	OFF
S12	UP	NORMAL	OFF
S13	DOWN	NORMAL	OFF
S14	LW	NORMAL	OFF
S15	MW	NORMAL	OFF
S16	FM	NORMAL	OFF
- S100 POWER: ON - STANDBY

THE UNDERLINED INDICATES THE SWITCH POSITION  
This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

IC301: AN7470	Q301-303,502	53-11, S14-16:
IC401: LA1260	40-404,606	AS6-711 (ASG-703)
IC701: TD6104P	608,701-707:	
IC702: TC9157AP	2SC1740S	
IC703: TD6301AP	Q304,407,408	
	501,605,607: ]	
Q101: 2SK241-Y	R05,6EB	V1: AAV-028
Q102: 2SC2786-L	(H25.6EB)	X701: ASS-025
Q103,201: 2SC2668		
Q104,105,406:	D101-103: ISV147	
2SK161-Y	D301,404,406-410	
(2SK241-Y)	501,502,507,509	
	702-704,707-709	
	IS1555	
	(US1035, IS131)	

C

D